

Putting the Power of Configuration in the hands of the users

ODTUG Kscope11 Abstract #: 237549

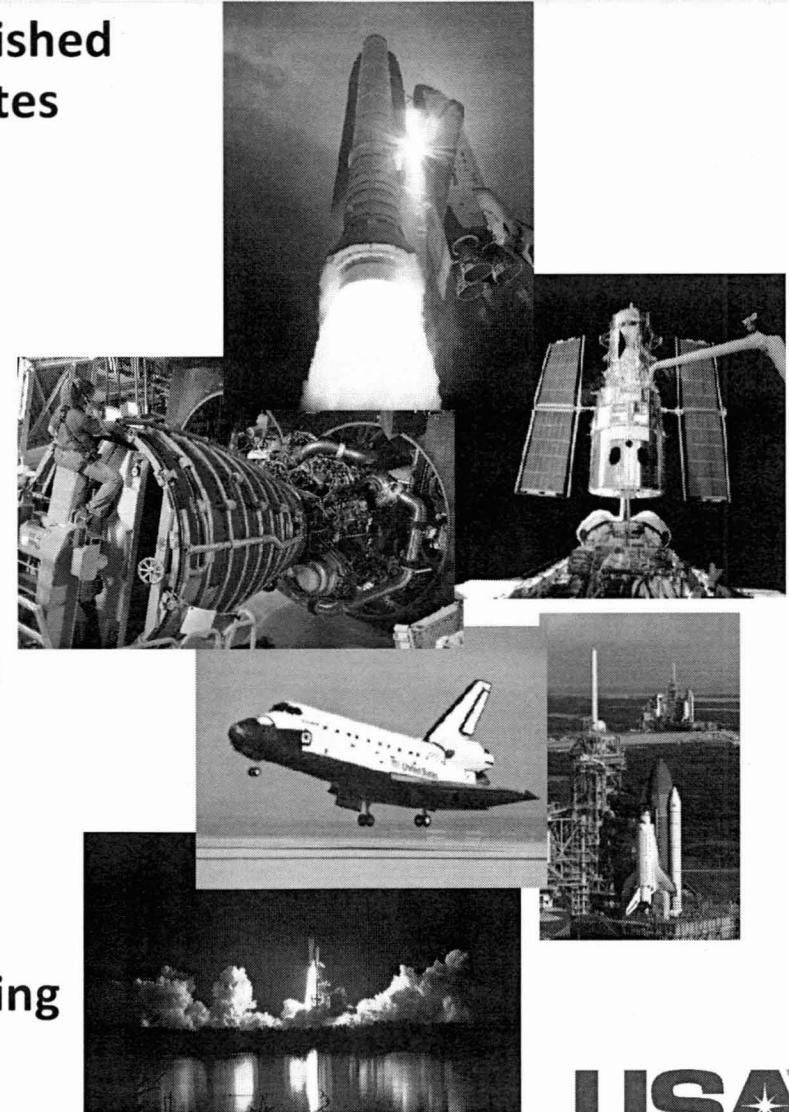
June 26-30, 2011

*MaryJo Al-Shihabi
Mark Brown
Marianne Rigolini*



United Space Alliance, LLC (USA)

- Headquartered in Houston, USA was established in 1995 with 8,800 employees working at sites in Texas, Florida, and Alabama
- Our mission is to provide safe, high-quality, best-value space operations, services and technologies to our customers
- World leader in Space Operations
 - Space Flight Mission Operations
 - Space Systems Integrated Logistics
 - Space Systems Integration and Program Management
 - Space Systems Ground Operations and Processing
 - Space Systems Flight Software
- Successfully completed end-to-end processing for 56 Space Shuttle Missions



Background

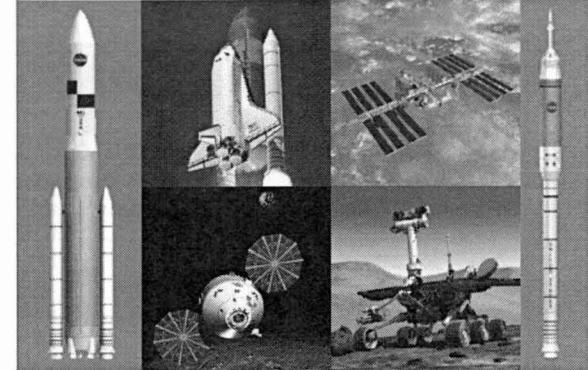
- USA's Space Flight Operations Contract represented the integration of 12 NASA contracts that were previously managed by dozens of independent and diverse contractors
 - Goal was to reduce the overall cost of human space flight while maintaining the most demanding standards for safety and mission success
- In support of this goal, a project team was chartered to replace 18 legacy Space Shuttle nonconformance processes and systems with one fully integrated system
 - Problem Reporting and Corrective Action (PRACA) processes provide a closed-loop system for the identification, disposition, resolution, closure, and reporting of all Space Shuttle hardware/software problems
 - PRACA processes are integrated throughout the Space Shuttle organizational processes and are critical to assuring a safe and successful program



Challenge

➤ Primary Project Objectives

- Develop a fully integrated system that provides automated workflow with electronic signatures
- Support multiple NASA programs and contracts with a single “system” architecture
- Define standard processes, implement best practices, and minimize process variations
- Reduce system operating costs and supportability risks

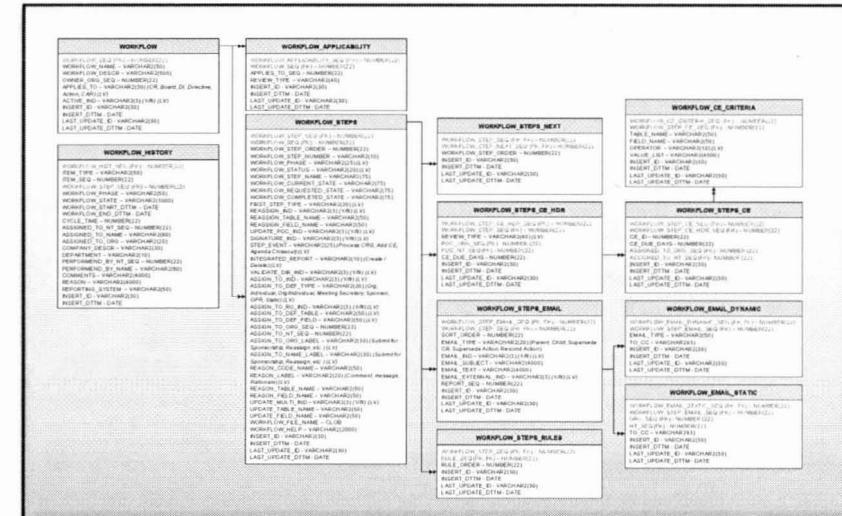


How do you integrate multiple diverse systems when the business and system requirements are not approved or even fully defined?

How do you get multiple customers to buy-in to a common process and system when historically they had complete independence and control?

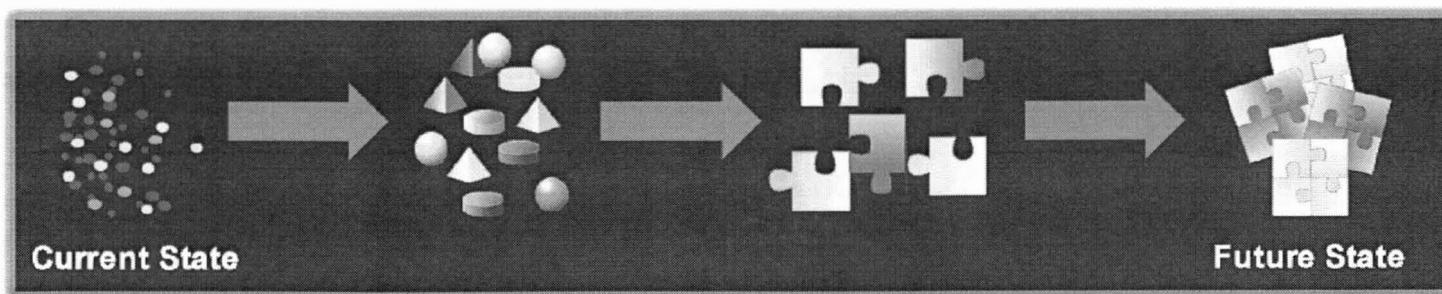
Solution – Design for Flexibility

- Develop a configurable system that can be tailored by the user community as new business processes are defined and customer buy-in evolves
- A configurable system allows many functions to be data driven, allowing users to configure and implement changes without software code impacts
 - Data Integrity Drivers – Value Lists, Validation Rules, and Security
 - Automated Workflow, Electronic Signatures, and E-Mail Notifications
 - Data Entry Screens
 - Change Tracking and Audit
 - In Box and Assignment Lists
 - Page and Field Level Help
 - System Interfaces
 - Search and Reporting
 - Fail-Over Architecture



Advantages

- Configurable systems allow development to proceed without a finalized business process
- Highly flexible and robust design that can support Enterprise, Contract, Program, and/or Organizational processing
- Users can control process change implementations more efficiently
- Software code changes are minimized\eliminated
 - Increased reliability and reduced downtime
 - Reduced testing and verification
 - Reduced system maintenance cost
- Reusable Software Code



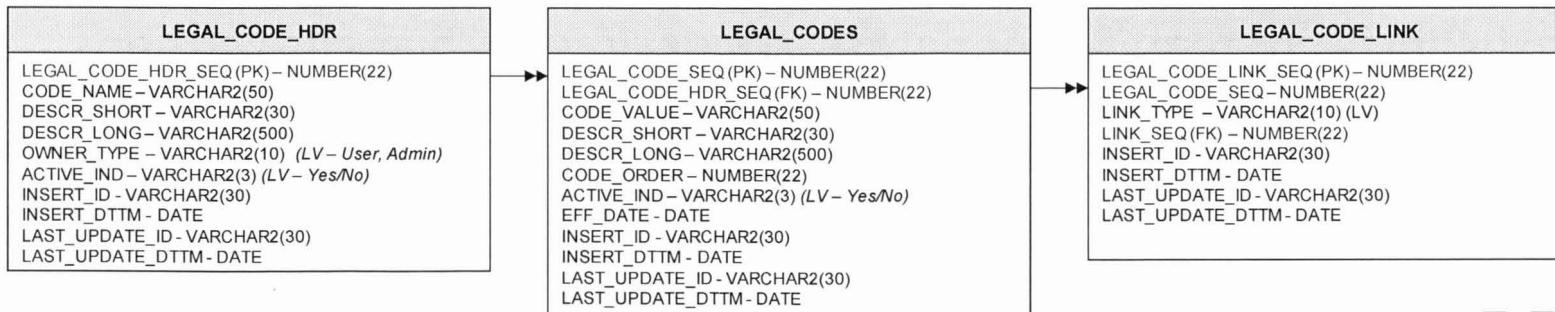
Configuration Design Approach

- Design for Flexibility and Growth
 - Determine the primary configuration drivers (i.e. Contract, Organization, and/or Process Variations)
 - Evaluate requirements to identify items that would benefit from a configurable design
 - High Risk requirements – details are not fully defined
 - Unique functionality required to support different contracts, organizations or processes
 - Areas where you anticipate change as the business process evolves
 - Reusable functions
- Consider hard-coding functions that will be applied across the application and flexibility is not required or necessarily desired such as core business requirements

**Cost benefits maximized with
a Balanced approach**

Example 1 – LOV Design

- Legal Values (or LOV) represents a list of valid values a user may select from a pre-defined list
- LOV maintained in a central table and dynamically derived
 - **LEGAL_CODE_HDR**– Groups the different legal value lists
 - CODE_NAME - Equates to the data field on a screen that is linked to the LOV
 - OWNER_TYPE – Defines who can update\maintain LOV
 - **LEGAL_CODES** – Contain the actual individual values
 - ACTIVE_IND – Allows the user to deactivate a value without removing it from the list
 - EFF_DATE – Identifies when the value became effective
 - **LEGAL_CODE_LINK** – Allows values to be filtered based on another value\field
 - LINK_TYPE and LINK_SEQ – Identifies the source field for the sub-filtering



Example 1 – LOV Configuration

Code Name : CATEGORY

Order	Value	Value Short Description	Value Active	Owner Type	Applies To Forms	Applies To Boards
10	Mission	Space Shuttle Mission Number	Yes	Form Type	SSP CR SSP Closeout CR	
20	Equipment	Equipment end-item or hardware serial number	Yes	Form Type	SSP CR SSP Closeout CR	
30	Facility	Manufacturing/processing building or work area	Yes	Form Type	SSP CR SSP Closeout CR	
40	Non-Flight Specific	Not associated with any specific flight, end-item, or facility	Yes	Form Type	SSP CR SSP Closeout CR	
50	Not Applicable		Yes	Form Type	SSP Closeout CR	

Code Name : CE E-Mail Recipient

Order	Value	Value Short Description	Value Active	Owner Type	Applies To Forms	Applies To Boards
10	Assigned To		Yes	Workflow		
20	QE Evaluator		Yes	Workflow		
30	CE Org Evaluators		Yes	Workflow		
40	CE Approver		Yes	Workflow		
50	CE POC		Yes	Workflow		
60	CR Initiator		Yes	Workflow		
70	CR DRR		Yes	Workflow		

Code Name : Values

Create/Edit Legal Value Type

Code Name: CATEGORY Type: Form Type Active: Yes
 Short Description: Effectivity category
 Long Description: Defines the mission, equipment, facility, etc affected and/or impacted by the change request

Audit Information

Inserted By/On: USAFL\FLEMMIJ 06/04/2009 07:35:48 AM
 Last Updated By/On: USATX\BROWNMA 04/25/2011 02:50:38 PM

Code Name : Values

Create/Update Legal Value

Value: Mission Order: 10 Active: Yes Effective: 06/04/2009
 Short Description: Space Shuttle Mission Number
 Long Description: Defines Effectivity by mission or STS cycle

Applies to Forms

Available: SSP ICB CR
 Selected: SSP CR
 SSP Closeout CR

Audit Information

Inserted By/On: USAFL\FLEMMIJ 06/04/2009 07:36:05 AM
 Last Updated By/On: USATX\BROWNMA 04/25/2011 02:42:58 PM

Values are filtered by Form Type

Example 1 – APEX LOV Definition

List of Values

Named LOV: - Select Named LOV -

Display Extra Values: No

Display Null Value: Yes

Null Display Value: - Select - Null Return Value: %null%

Cascading LOV Parent Item(s):

List of values definition

```
SELECT CODE_VALUE "D", CODE_VALUE "R"
  FROM CMST_LEGAL_CODES_ACTIVE_VW V, cmst_legal_code_link L WHERE CODE_NAME
= 'CATEGORY' and v.legal_code_seq=1.legal_code_seq
      and L.link_type='CR_FORM' and L.link_seq=:P2004_CR_FORM_SEQ
ORDER BY CODE_ORDER
```

Create or edit static List of Values

Create Dynamic List of Values

List of Values Examples

Change Request CR000790

SSP CR Page 1 / SSP CR Page 2 / Attachments (1) / Evaluations / CR Processing / Disposition / Workflow / Save Updates

Next Step: Go

Space Shuttle Program Change Request

Page 2 of 2

Add CR Effectivity - Windows Internet Explorer

Cancel / Create

Category: Mission

Mission: Select - Mission

Comments: Equipment, Facility, Non-Flight Specific

Display Order: 20

And Subs

Add

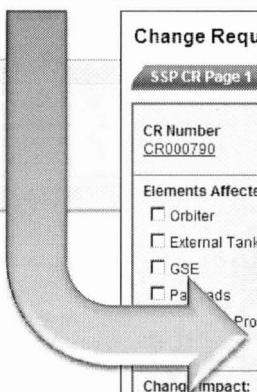
Processing

Change Impact: Performance, Schedule, Transition

SAFE

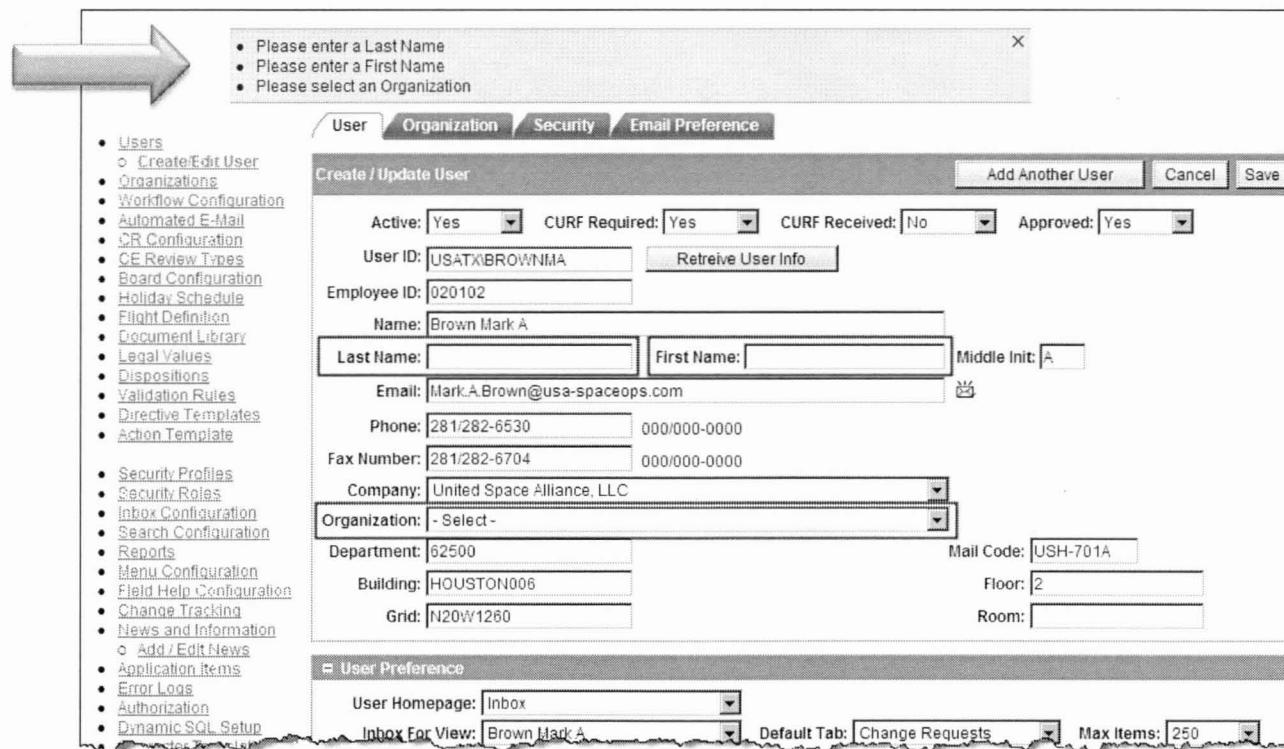
Screen: 2004 User: USATXBROWNMA Current Build: 0.06.00 3/14/2011 Curator/RDM: Mark A. Brown

Delta SFR



Example 2 – Validation Rules

- Validation Rules are used to ensure compliance with customer, company, organizational, and system data requirements
- Validation Rule configuration design generates an SQL statement that is evaluated when a Button is selected or a Workflow step is processed
- System will not commit changes until all validation errors are resolved



A screenshot of a 'Create / Update User' form. A large red arrow points to a validation error message box at the top right. The message box contains three items:

- Please enter a Last Name
- Please enter a First Name
- Please select an Organization

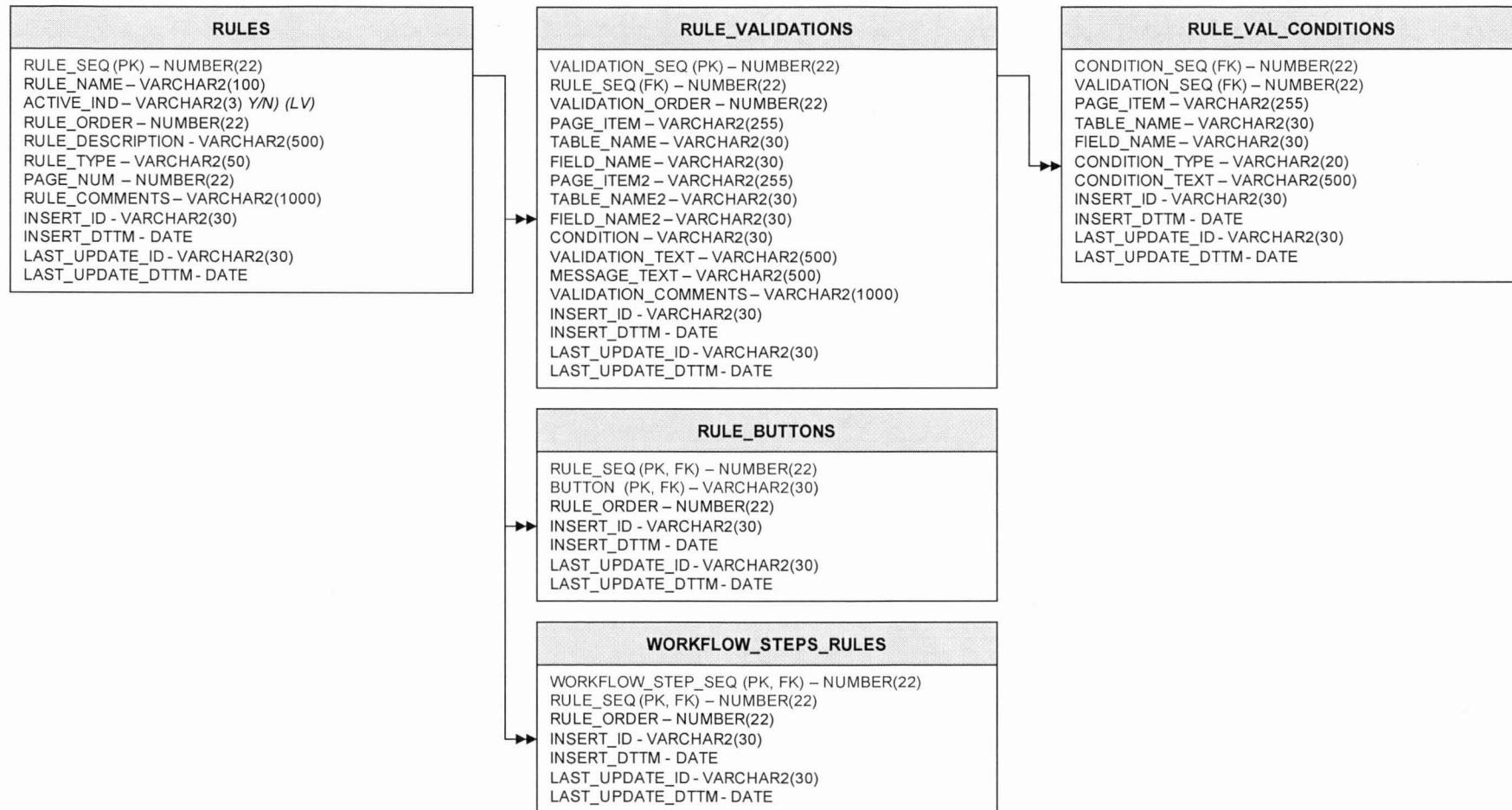
The form itself has the following fields:

- Active: Yes
- CURF Required: Yes
- CURF Received: No
- Approved: Yes
- User ID: USATXBROWNMA
- Employee ID: 020102
- Name: Brown Mark A
- Last Name: (highlighted in red)
- First Name: (highlighted in red)
- Middle Init: A
- Email: Mark.A.Brown@usa-spaceops.com
- Phone: 281/282-6530
- Fax Number: 281/282-6704
- Company: United Space Alliance, LLC
- Organization: - Select- (highlighted in red)
- Department: 62500
- Building: HOUSTON006
- Grid: N20W1260
- Mail Code: USH-701A
- Floor: 2
- Room: (highlighted in red)

Below the main form is a 'User Preference' section with the following settings:

- User Homepage: Inbox
- Inbox For View: Brown Mark A
- Default Tab: Change Requests
- Max Items: 250

Example 2 – Validation Rule Design



Example 2 – Validation Rule Configuration

Rule **Validations**

Create/Edit Validation Rule

Rule Name: 2-01 Active: Yes Order: 10

Description: Validate User Information Mandatory Data

40 of 500

Rule Type: Admin Screen: 2 - Create/Update User

Comments:

Applies to Buttons

Available: Add Another User (ADD), Cancel (CANCEL), Retreive User Info (ACTIVE_DIRECTORY_UPDATE)

Selected: Create (CREATE), Save (SAVE)

Audit Information

Inserted By/On: USATX\BROWNMA 04/06/2011 01:04:11 PM
 Last Updated By/On: USATX\BROWNMA 04/21/2011 02:27:47 PM

Conditions may be applied to a Validation Rule to limit the applicability of the rule

Validation Rules

Select	Order	Item	Condition	Validation Text	Conditions
<input type="checkbox"/>	10	User ID (P2_NT_ID)	is not null		Show(0)
<input type="checkbox"/>	20	Name (P2_NAME)	is not null		Hide
<input checked="" type="checkbox"/>	30	Last Name (P2_LNAME)			Show(1)
<input type="checkbox"/>	40	First Name (P2_FNAME)			Show(1)
<input type="checkbox"/>	50	Email (P2_EMAIL_ID)			Show(1)
<input type="checkbox"/>	60	Phone (P2_PHONE)			Show(1)
<input type="checkbox"/>	70	Company (P2_COMPANY)			Show(1)
<input type="checkbox"/>	80	Organizational (P2_OU)			Show(1)
<input type="checkbox"/>	90	User HomeSpace (P2_HOMESPACE)			Show(1)
<input type="checkbox"/>	100	Inbox For View (P2_INBOX)			Show(1)
<input type="checkbox"/>	110	Default List (P2_LIST)			Show(1)
<input type="checkbox"/>	120	Max Items (P2_MAXITEMS)			Show(1)
<input type="checkbox"/>	130	Dashboard For View			Show(1)
<input type="checkbox"/>	140	Search Type (P2_SEARCH_TYPE)			Show(1)
<input type="checkbox"/>	150	Max Items per Page (P2_SEARCH_ITEMS)	is not null		Show(1)
<input type="checkbox"/>	160	Advanced Search (P2_ADVANCED_SEARCH_LIST)	is not null		Show(1)

Rule Validations - Windows Internet Explorer

Create/Edit Validation

Order: 20 Page Item: Name (P2_NAME) Condition: Item is not null

Validation Text: Please enter a User's Name

Comments:

Audit Information

Inserted By/On: USATX\BROWNMA 04/05/2011 01:04:45PM
 Last Updated By/On: USATX\BROWNMA 04/06/2011 03:05:58PM

Screen: 49 Current Build: 0.0.00 3/14/2011
 User: USATX\BROWNMA Curator/RDM: Mark A. Brown

Conditions

Select	Item	Condition	Condition Text
<input type="checkbox"/>	Active (P2_ACTIVE_INDICATOR)	is equal to	Yes

Example 2 – APEX Validation Function

Page Validation: 1 of 1 Name: Get Screen Error Messages

Cancel Delete Apply Changes

Show All Validation Error Message Conditions Security Configuration Comments

Validation

Page: 2 Create/Update User

* Name Get Screen Error Messages

* Sequence 40

Type Function Returning Error Text

* Validation Expression 1

```
BEGIN
  RETURN CMST_VALIDATION_PACK.GET_ERROR_MESSAGES(null,:APP_PAGE_ID, :REQUEST,null, null);
END;
```

• Please enter a Last Name
• Please enter a First Name
• Please select an Organization

User Organization Security Email Preference

Create / Update User

Active: Yes CURF Required: Yes CURF Received: No Approved: Yes

User ID: USATXBROWNMA Retrieve User Info

Employee ID: 020102

Name: Brown Mark A

Last Name: First Name: Middle Init: A

Email: Mark.A.Brown@usa-spaceops.com

Phone: 281/282-6530 000/000-0000

Fax Number: 281/282-6704 000/000-0000

Company: United Space Alliance, LLC

Organization: Select

Department: 62500 Mail Code: USH-701A

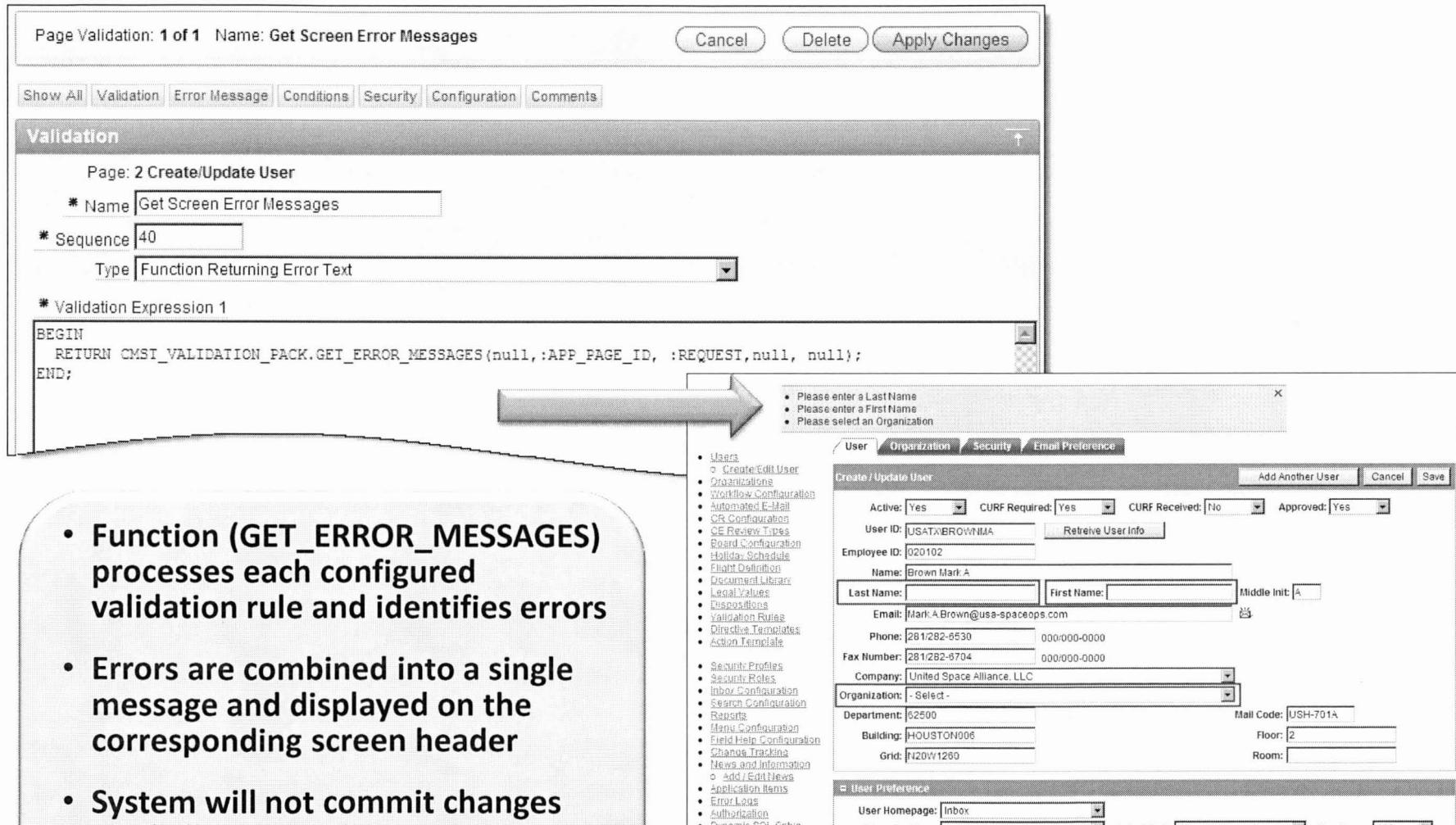
Building: HOUSTON006 Floor: 2

Grid: N20W1260 Room:

User Preference

User Homepage: Inbox

Inbox For View: Brown Mark Default Tab: Change Requests Max Items: 250

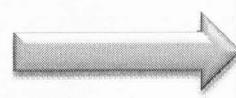


- **Function (GET_ERROR_MESSAGES)** processes each configured validation rule and identifies errors
- Errors are combined into a single message and displayed on the corresponding screen header
- System will not commit changes until all validation errors are resolved

Example 2 – APEX Validation Behind the Scenes

```
FOR validations IN (SELECT V.* FROM CMST_RULES R, CMST_RULE_VALIDATIONS V, CMST_RULE_BUTTONS RB
    WHERE R.RULE_SEQ = RB.RULE_SEQ AND R.PAGE_NUM = p_page_number AND RB.BUTTON = p_request AND R.RULE_SEQ = V.RULE_SEQ
        AND V.PAGE_ITEM IS NOT NULL AND NVL(R.ACTIVE_IND,'No') = 'Yes' AND (v_cr_form_seq IS NULL OR v_cr_form_seq
        IN (SELECT CR_FORM_SEQ FROM CMST_RULE_CR_FORMS WHERE RULE_SEQ = R.RULE_SEQ)) ORDER BY R.RULE_ORDER, V.VALIDATION_ORDER)
LOOP
    v_run_val := TRUE;
    --CHECK ALL CONDITIONS TO SEE IF THE VALIDATION SHOULD RUN
    FOR condition IN (SELECT PAGE_ITEM, TABLE_NAME, FIELD_NAME, CONDITION_TYPE, CONDITION_TEXT
        FROM CMST_RULE_VAL_CONDITIONS
        WHERE VALIDATION_SEQ = validations.VALIDATION_SEQ
            AND PAGE_ITEM IS NOT NULL)
    LOOP
        v_sql := 'SELECT 1 FROM DUAL WHERE ' || CMST_SQL_PACK.GET_SQL_COMPARE_TEXT(GET_DATATYPE(condition.CONDITION_TEXT))
            , GET_PAGE_ITEM_QUERY_TEXT(condition.PAGE_ITEM), condition.CONDITION_TYPE, condition.CONDITION_TEXT);
        BEGIN
            execute immediate v_sql INTO v_count;
        EXCEPTION
            WHEN NO_DATA_FOUND THEN v_count := 0;
            WHEN OTHERS THEN v_count := 1;
        END;
        IF v_count = 0 THEN v_run_val := FALSE;
        EXIT; --NO REASON TO GO ON, EXIT THE LOOP AND DON'T RUN THE VALIDATION
        END IF;
    END LOOP;
    IF v_run_val THEN
        IF UPPER(validations.VALIDATION_TEXT) = 'SYSDATE' THEN
            v_sql := 'SELECT 1 FROM DUAL WHERE TO_DATE(V(''' || validations.PAGE_ITEM || '''),''MM/DD/YYYY'') ' || validations.CONDITION ||
        ' TRUNC(' || validations.VALIDATION_TEXT || ')';
        ELSE
            IF validations.PAGE_ITEM2 IS NOT NULL THEN
                v_sql := 'SELECT 1 FROM DUAL WHERE '
                    ||
                CMST_SQL_PACK.GET_SQL_COMPARE_TEXT(GET_DATATYPE(validations.VALIDATION_TEXT), GET_PAGE_ITEM_QUERY_TEXT(validations.PAGE_ITEM)
                    , validations.CONDITION, GET_PAGE_ITEM_QUERY_TEXT(validations.PAGE_ITEM2));
            ELSE
                v_sql := 'SELECT 1 FROM DUAL WHERE ' || CMST_SQL_PACK.GET_
                    , GET_PAGE_ITEM_QUERY_TEXT(validations.PAGE_IT
                END IF;
            END IF;
            BEGIN
                execute immediate v_sql into v_count;
            EXCEPTION
                WHEN OTHERS THEN v_count := 0;
            END;
            IF v_count = 0 THEN v_errors := v_errors || validations.MESS
            END IF;
        END IF;
    END LOOP;
```

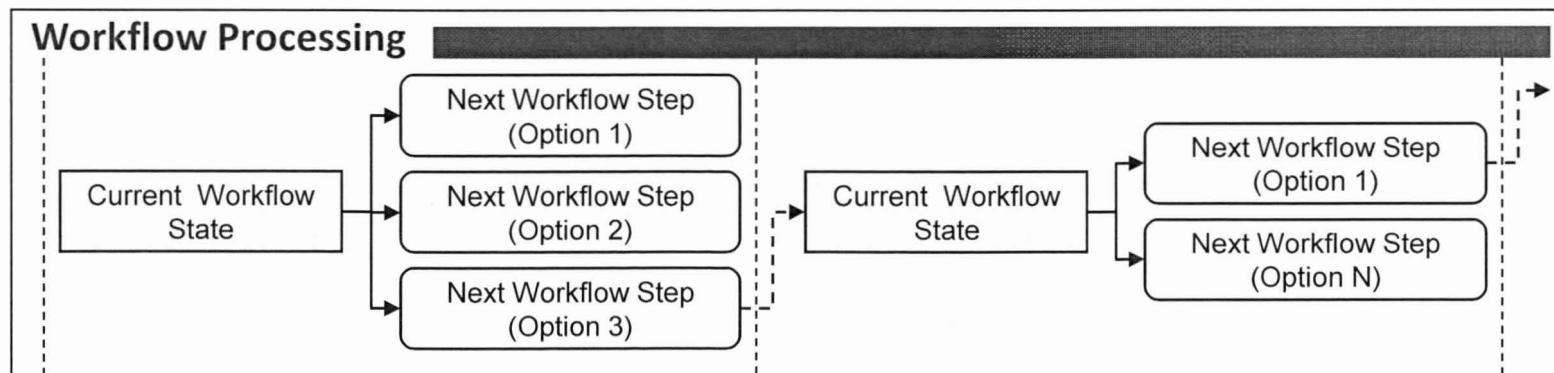
Loop through Rules to generate SQL



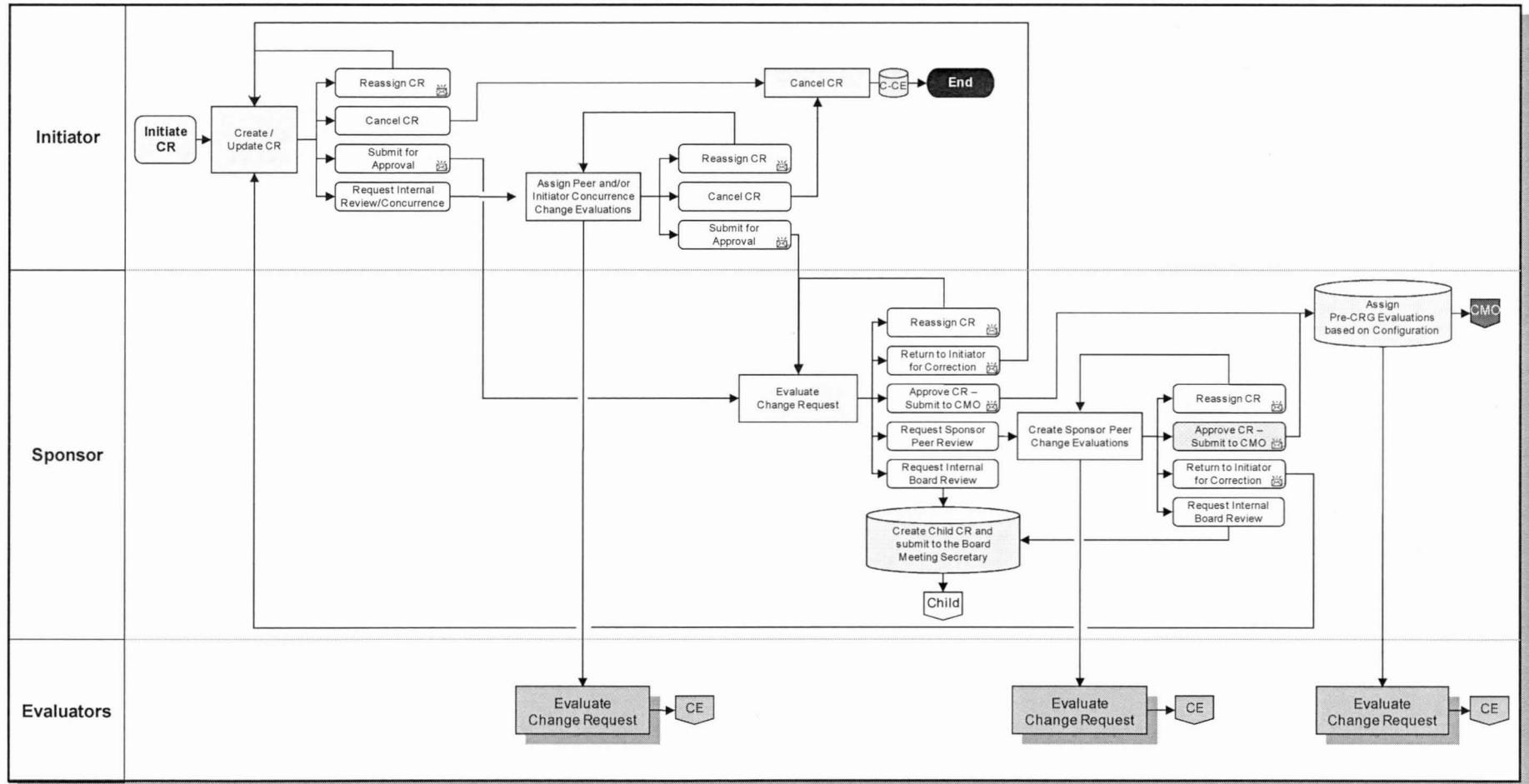
```
SELECT 1 FROM DUAL WHERE V('P2_NT_ID') IS NOT NULL
SELECT 1 FROM DUAL WHERE V('P2_NAME') IS NOT NULL
SELECT 1 FROM DUAL WHERE V('P2_LAST_NAME') IS NOT NULL
SELECT 1 FROM DUAL WHERE V('P2_FIRST_NAME') IS NOT NULL
SELECT 1 FROM DUAL WHERE V('P2_EMAILID') IS NOT NULL
SELECT 1 FROM DUAL WHERE V('P2_PHONE') IS NOT NULL
SELECT 1 FROM DUAL WHERE V('P2_COMPANY_DESCR') IS NOT NULL
```

Example 3 – Automated Workflow

- **Workflow is the automation of a business process where information is passed from one state to another for action in accordance with a set of pre-defined business rules**
 - **Configurable workflow design includes a current workflow step, potential next step(s), assignee information, e-mail notifications, and automated process activities**
 - **Workflow is accomplished by the user selecting the next appropriate step from a list of pre-defined\configured options and the system performing the associated activities**

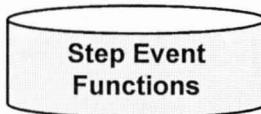


Example 3 – Sample Workflow



Current Step

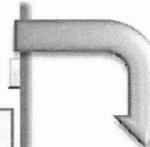
Next Step Options



Spawned Workflow

Example 3 – Workflow User Interface

Change Request CR000773

Next Step: Approve CR - Submit to CMO 

CR Number <u>CR000773</u>	Space Shuttle Program Closeout Change Request	
Initiated By: Brown Mark A	Organization: PI TIS	Phone: 281/282-6530
Change Title: Update NSTS 07700 Volume XX - Orbiter End State Requirements 61 of 150		
Change Proposal/Request Numbers: <input type="button" value="Add"/> <input type="text" value="CR000002"/>	SSP Documents Affected:  <u>NSTS 07700, Volume XX</u> Transition and Requirements	
Description of Change: This CR Requests: <input type="button" value="ABC"/>		

Additional Information

Reason:

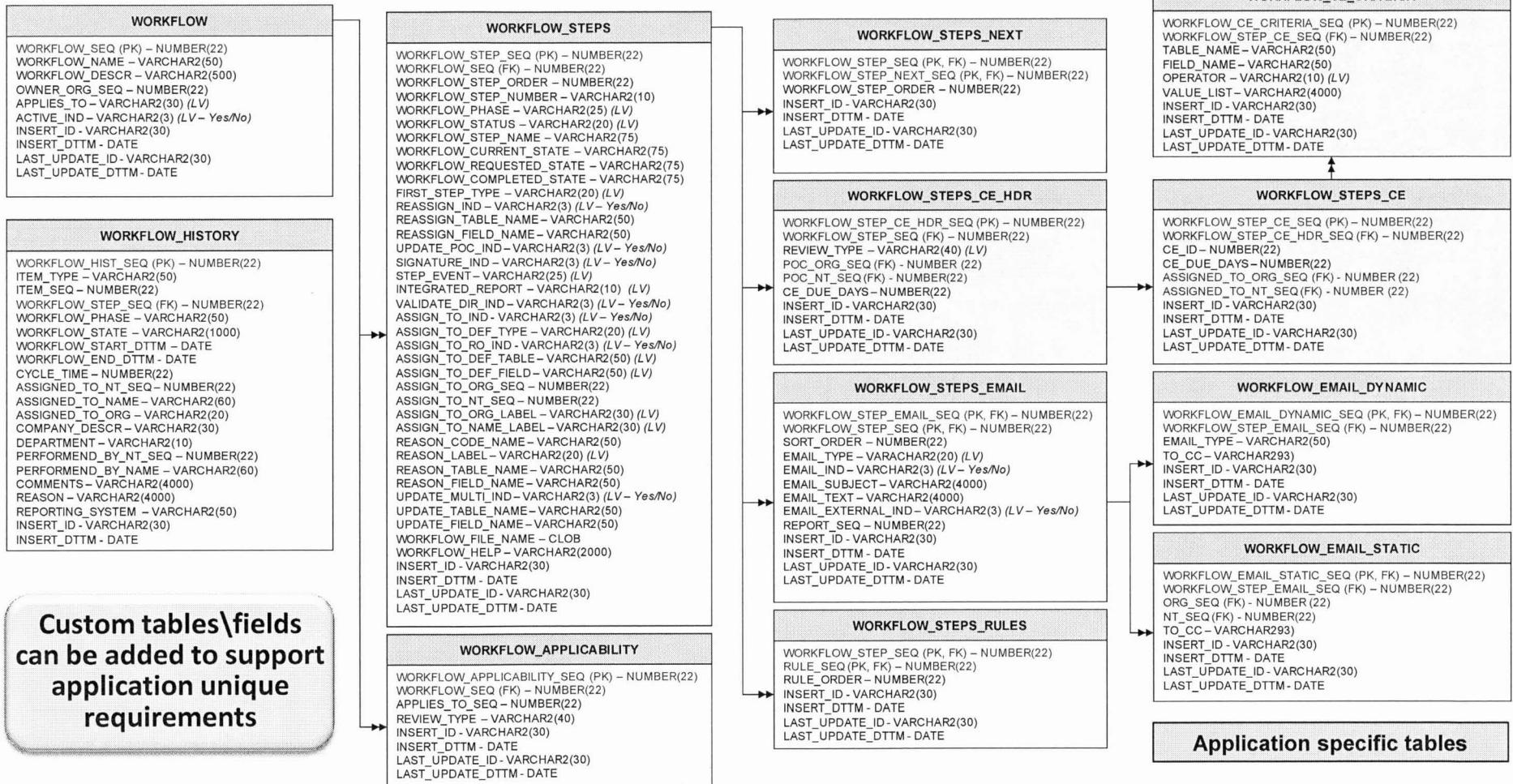
Requested Processing:

Password:

Are you sure you would like to Approve CR - Submit to CMO?

- Based on the workflow configuration, the user is presented with one or more Next Step options
- System determines the processing requirements and opens a pop-up that is dynamically generated based on the selected Next Step
- System runs the Validation Rules, processes the required updates, and notifies the affected users

Example 3 – Workflow Design



Example 3 – Configuration Design

Description **Workflow Steps**

Create / Edit Workflow

Workflow Name: **SSP CR** Active: **Yes**

Description: Space Shuttle Program Change Request (CR) Workflow

Owner Organization: **MG**

Applies To: **CR**

Applies To Forms

Available: **SSP ICB CR**

Selected: **SSP CR**
SSP Closeout CR

Audit Information

Inserted: USAFLI\HARTJR1 07/08/2009 08:07:05 AM
Last Updated: USATX\BROWNMMA 04/28/2011 10:15:56 AM

Description **Workflow Steps**

Workflow Steps

Select	Order	Step	Phase	Current State	Requested State	Step Event	Step Type
<input type="checkbox"/>	10	1	Initiation	Initiating Change Proposal	Initiate Change Proposal		Main Workflow
<input type="checkbox"/>	20	2	Internal Review	In Internal Review	Request Internal Review / Concurrence		
<input type="checkbox"/>	30	3	Sponsorship	In Sponsor Approval	Submit for Approval		
<input type="checkbox"/>	40	4	Sponsor Review	In Sponsor Peer Review	Request Sponsor Peer Review		
<input type="checkbox"/>	50	5	Sponsorship	In Internal Board Review	Request Internal Board Review	Create Child CR	
<input type="checkbox"/>	60	6	CMO Processing	Processing Change Proposal	Approve CR - Submit to CMO	Add CE	
<input type="checkbox"/>	70	6c	Board Scheduling	Scheduling Child CR	N/A - Child CR First Step	Child CR	
<input type="checkbox"/>	80	7	Initiation	Returned for Update	Return to Initiator for Correction		
<input type="checkbox"/>	90	10	Disposition	Processing Outside of Board	Process Outside of Board	Process CR	
<input type="checkbox"/>	100	10c	In Board Review	Processing Outside of Board	Process Outside of Board	Process CR	Process Child CR OSB
<input type="checkbox"/>	110	11	Disposition	In Board Review	Schedule to Board	Process CR	
<input type="checkbox"/>	120	11c	In Board Review	Child CR Scheduled for Board Review	Schedule to Board	Process CR	Process Child CR
<input type="checkbox"/>	130	7	Rework	Returned for Update	Return to Initiator for Correction		
<input type="checkbox"/>	140	12	Initiation	Updating per CMO Comments	Update CR - Remove Sponsor's Approval	Reset Signatures	
<input type="checkbox"/>	150	13	CMO Processing	Resubmitted for Processing	Return to CMO		
<input type="checkbox"/>	160	999	Closure	Change Proposal Cancelled	Cancel Change Proposal		
<input type="checkbox"/>	170	999	Closure	Reject Change Proposal	Reject / Close CR	Reject CR	
<input type="checkbox"/>	180	999c	Closure	Review Complete	Review Complete - Close Child CR	Close Child CR OSB	
<input type="checkbox"/>	190	999c	Closure	CR Superseded - Review for Closure	Parent CR Superseded - Close Child CR	Supersede CR	
<input type="checkbox"/>	200	999c	Closure	CR Withdrawn - Review for Closure	Parent CR Closed - Withdraw Close CR	Withdraw CR	
<input type="checkbox"/>	210	9999	Initiation	Reassigning Task	Reassign Task	Reassign	

1 - 21

Example 3 – Configuration Design

Workflow Step Next Steps Add CES Data Validation E-Mail

Create/Edit Workflow Step

Step Name: Approved - Submit to CMO

Workflow Phase: CMO Processing Workflow Status: Draft

Step Number: 6 Sort Order: 60 Step Type: - Select -

Current State: Processing Change Proposal

Requested State: Approve CR - Submit to CMO

Completed State: CMO Processing Complete

Step Event: Add CE

Printable Version: Create

Include Reassign Option?: Yes Update CE POC?: Yes

Update User in Table: - Select -

Reassign Field Name: - Select -

E-Signature Required?: Yes

Step File Name:

Assign To Information

Assignment Type: Meeting Secretary Org

Display Assigned To: No

Read Only: - Select -

Table: - Select -

Field: - Select -

Organization: - Select -

Individual: - Select -

Assigned To Org Label:

Assigned To Name Label:

- Step Events represent PL\SQL procedures that run specific functions when the workflow step is processed
- Assigned To Information can be static (read-only) or dynamically derived
- Help information for the Next Step options are displayed from the Workflow label

Response Comments / Rationale

Legal Value Code Name: RECOMMENDED_PROCESSING

Message Label: Requested Processing

Load Response into Table: CMST_CR_PROCESSING_FW

Load Response into field: RECOMMENDED_PROCESSING

Workflow Completion Updates (Applied when Step is Selected)

Update Multiple fields: Yes

Update Table: CMST_CR_PROCESSING_FW

Update Field: Sponsor

Workflow Step Help Description



The CR is approved by the sponsor and submitted to the Configuration Management Office for community review and disposition. An automated e-mail notification is sent to the CMO office and a task will appear in their inbox until the CR is processed.

Additional help is located in the CMST Project Website: <https://usa1.usa-spaceops.com/>

Audit Information

Inserted: USATXBROWNMIA07/10/2009 10:09:13AM
Last Updated: USATXBROWNMIA04/28/2011 10:44:20AM

Example 3 – Sample Step Events

```
-- Step Event
CASE NVL(p_workflow_step.STEP_EVENT, 'NULL')
WHEN 'Add CE' THEN
  ADD_CE_FROM_WORKFLOW(
    p_cr_processing_seq => p_cr_processing_seq
    ,p_workflow_step_seq => p_workflow_step.WORKFLOW_STEP_SEQ
    ,p_poc_org => v_assign_to_org
    ,p_poc_user => v_assign_to_user);

WHEN 'Process CR' THEN
  UPDATE CMST_CR_PROCESSING
    SET CRG_DATE = SYSDATE,
        CRG_CHAIR_NT_SEQ = p_user.NT_SEQ,
        CRG_CHAIR_NAME = p_user.NAME
      WHERE CR_PROCESSING_SEQ = p_cr_processing_seq;
  IF v_cr.PROCESSED_OSB_IND = 'Yes' THEN
    DELETE FROM CMST_CR_CRG
      WHERE CR_PROCESSING_SEQ = p_cr_processing_seq;
  ELSE
    FOR crg IN (SELECT CR_CRG_SEQ
                 FROM CMST_CR_CRG
                WHERE CR_PROCESSING_SEQ = p_cr_processing_seq)
    LOOP
      CMST_AGENDA_PACK.PROCESS_CRG(
        p_cr_crg_seq => crg.CR_CRG_SEQ
        ,p_cr_seq      => v_cr.CR_SEQ
        ,p_cr_processing_seq => p_cr_processing_seq);
    END LOOP;
  END IF;

WHEN 'Reset Signatures' THEN
  UPDATE CMST_CR
    SET SPONSOR_ORG_SEQ = NULL,
        SPONSOR_ORG = NULL,
        SPONSOR_ORG_DESCR = NULL,
        SPONSOR_NT_SEQ = NULL,
        SPONSOR_NAME = NULL,
        SPONSOR_COMPANY = NULL,
        SPONSOR_DTTM = NULL
      WHERE CR_SEQ = v_cr.CR_SEQ;
```

“Add CE” creates new Change Evaluations based on the Workflow CE configuration

“Process CR” updates the Change Review Group Information and adds the CR to the Review Board Agenda

“Reset Signatures” removes the applied Signature Information

Example 3 – Configuration Design

Workflow Step Next Steps Add CEs Data Validation E-Mail

Next Steps

Order	Step Name	Requested State
10	Schedule to Board	Schedule to Board
20	Processing Outside of Board	Process Outside of Board
30	Return for Rework (from CIO)	Return to Initiator for Correction
40	Reject Change Proposal	Reject / Close CR

1 - 4

Previous Steps

Step Name	Requested State
Request Internal Board Review	Request Internal Board Review
Request Sponsor Peer Review	Request Sponsor Peer Review
Sponsor Change Proposal	Submit for Approval

1 - 3

Workflow steps are linked together to create an end-to-end integrated process

Workflow Step Next Steps Add CEs Data Validation E-Mail

CE Reviews

Review Type: CRG Pre-Review

Select	Order	Assigned To	Due Day(s)	Conditions	Updated
<input type="checkbox"/>	10	USA MI	1	Show(1)	03/18/2010 Fleming Melody J

Automatically generate new Tasks

Workflow Step Next Steps Add CEs Data Validation E-Mail

Data Validation Rules

Order	Rule Name	Description
10	CR Sponsorship	Validate Mandatory data exists to Sponsor \ Submit CR
20	Submit CR to CMO	Validate Risk Assessment Exists for USA Sponsored CRs

1 - 2

Multiple Validation Rules can be linked to each workflow steps

Example 3 – Configuration Design

Workflow Step Next Steps Add CEs Data Validation E-Mail

Workflow E-Mail

Select	Order	Send E-Mail	Type	Subject	Updated
<input type="checkbox"/>	1	Yes	Current Record	[ITEM NUMBER] has been submitted for Processing	02/18/2010 Brown Mark A
<input type="checkbox"/>	20	Yes	Superseded CR	[ITEM NUMBER] was Superseded by [PARENT NUMBER]	04/27/2011 Brown Mark A

Add Delete Save

Create/Edit Workflow E-Mail

Order: 1 Type: Current Record Active: Yes

Copy From: - Select -

Email Subject: [ITEM NUMBER] has been submitted for Processing

Email Text:

[ITEM NUMBER] has been approved by the sponsor and is ready for CMO processing.

[ITEM NUMBER] - [TITLE]

Item Number: [ITEM NUMBER]
Initiator: [INITIATOR]
Title: [TITLE]

Attach Report: - Select -

E-Mail Recipients

Dynamic Recipients: CR OPR
CR Sponsor
Watch Items

To → Assigned To

Delete

Static Recipients: Type Name or Select from List

CC → CR Initiator

Delete

Al-Shihabi MaryJo Y
AS

Screen: 143
User: USATX\BROWNMA

Current Build: 0.08.00 3/14/2011
Curator|RDM: Mark A. Brown

Each Workflow Step can generate multiple e-mail notifications

E-Mails are configured using a library of dynamic tags

Recipients can either be dynamically generated based on the linked record or defined statically

Example 4 – Audit Tracking Design

- Audit tracking at the field level is a balance between business need and system performance
- Configurable audit tracking allows business owner to decide which fields require traceability and alter as business processes change
- Database trigger is built based on Field Selections dynamically

Columns

Change Tracking

Table Name: CMST_ATTACHMENTS

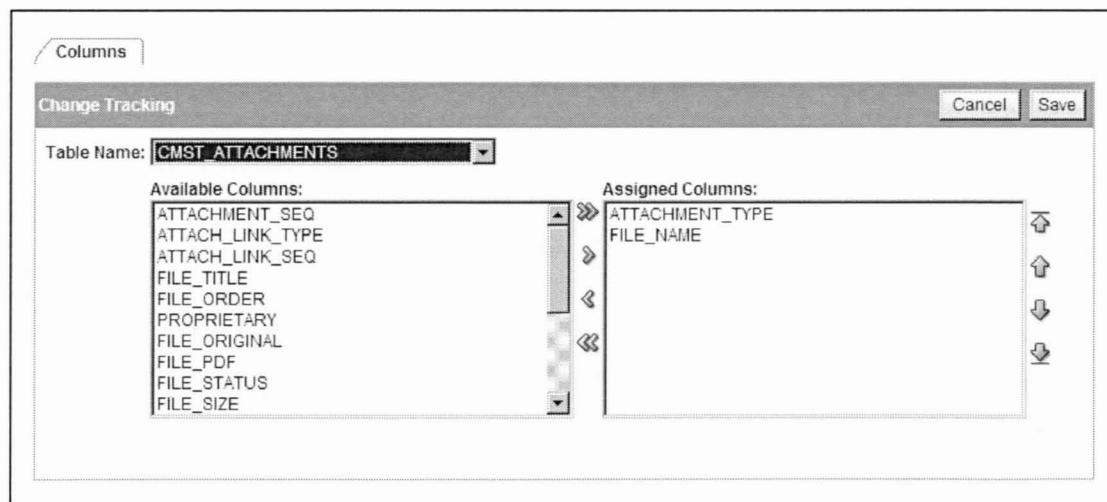
Available Columns:

- ATTACHMENT_SEQ
- ATTACH_LINK_TYPE
- ATTACH_LINK_SEQ
- FILE_TITLE
- FILE_ORDER
- PROPRIETARY
- FILE_ORIGINAL
- FILE_PDF
- FILE_STATUS
- FILE_SIZE

Assigned Columns:

- ATTACHMENT_TYPE
- FILE_NAME

Cancel Save



AUDIT_TABLES
AUDIT_TABLE_SEQ (PK) – VARCHAR2(100) TABLE_NAME – VARCHAR2(30) COLUMN_NAME – VARCHAR2(30) DISPLAY_ORDER – NUMBER(22) TRIGGER_COMPILED – DATE INSERT_ID – VARCHAR2(30) INSERT_DTTM – DATE LAST_UPDATE_ID – VARCHAR2(30) LAST_UPDATE_DTTM – DATE
AUDIT_TEMPLATE
AUDIT_SEQ (PK) – NUMBER(22) AUDIT_DATE – DATE AUDIT_ACTION – VARCHAR2(15) COLUMN_NAME – VARCHAR2(30) NEW_VALUE – VARCHAR2(4000) OLD_VALUE – VARCHAR2(4000) DESCRIPTOR – VARCHAR2(100) REPORTING_SYSTEM – VARCHAR2(50) LAST_UPDATE_ID – VARCHAR2(30)

Example 4 – Dynamic Trigger Generation

Step 1: Find the Audit Columns

```
cursor col_cursor is
  select column_name, rownum
  from CMST_audit_tables
  where table_name = audit_table_name;

cursor cons_cursor is
  select column_name, position
  from all_cons_columns
  where table_name = audit_table_name
    and (constraint_name like 'PK_%' OR constraint_name like '%_PK')
    and owner = 'APPL_CMST'
  order by position;

cursor CHILD_CONS_CURSOR IS
  SELECT DISTINCT child_cc.COLUMN_NAME --, rownum, child_cc.position
  FROM all_cons_columns child_cc,
       all_cons_columns parent_cc,
       all_tab_columns atc
  WHERE child_cc.OWNER = 'APPL_CMST'
    AND child_cc.table_name = audit_table_name
    AND atc.COLUMN_ID < 4
    AND child_cc.CONSTRAINT_NAME LIKE 'FK_%'
    AND (PARENT_CC.constraint_name like 'PK_%' OR PARENT_CC.constraint_name like '%_PK')
    AND parent_cc.column_name = child_cc.COLUMN_NAME
    AND atc.TABLE_NAME = child_cc.TABLE_NAME
    AND atc.COLUMN_NAME = child_cc.COLUMN_NAME
```

Selects Columns identified in the Panel

Finds Primary Key to store with audit records

Finds Foreign Keys associated with record

Step 2: Create the Trigger

```
v_trigger_name := trim(substr('A_AUD_'||audit_table_name,1,30));
sql_hdr      := 'CREATE OR REPLACE TRIGGER ' ||v_trigger_name || '
                 AFTER UPDATE or DELETE on ' ||audit_table_name || '
                           for each row DECLARE v_descriptor VARCHAR2(100); BEGIN ';
```

Example 4 – Dynamic Trigger Generation

➤ Step 3: Add Dynamic Body

```
:= trigger_body || ' IF UPDATING THEN ';

sql_cols := sql_seq_name||', AUDIT_ACTION, AUDIT_DATE, LAST_UPDATE_ID, COLUMN_NAME, OLD_VALUE, NEW_VALUE, DESCRIPTOR';
open cons_cursor;
loop
  fetch cons_cursor into v_con_col, v_con_cnt;
  exit when cons_cursor%notfound;
  sql_cols := sql_cols||', ''||v_con_col';
  v_insert_values_suffix := v_insert_values_suffix||', :old.'||v_con_col;
end loop;
close cons_cursor;
open col_cursor;
loop
  fetch col_cursor into v_col, v_cnt;
  exit when col_cursor%notfound;
  v_if_value_compare := ' IF (nvl(to_char(:new.'||v_col||'),'A')  <> nvl(to_char(:old.'||v_col||'),'A')) then ';
  select data_type
  into v_data_type
  from all_tab_columns
  where table_name = audit_table_name
    and column_name = v_col
    AND OWNER = 'APPL_CMST';
  If v_data_type = 'DATE' then
    sql_valuesI := ' VALUES ('||sql_seq_name||'.NEXTVAL,''U'',sysdate, nvl(wvv_flow.g_user,user),'''||v_col||'',',
    to_char(:old.'||v_col||',''DD-Mon-YYYY HH:Mi:SS am''), to_char(:new.'||v_col||',''DD-Mon-YYYY HH:Mi:SS am''), v_descriptor';
  elsif v_data_type = 'CLOB' then
    v_if_value_compare := ' IF (nvl(:new.'||v_col||',''A'')  <> nvl(:old.'||v_col||',''A'')) then';
    sql_valuesI := ' VALUES ('||sql_seq_name||'.NEXTVAL,''U'',sysdate, nvl(wvv_flow.g_user,user),'''||v_col||'',:old.'||v_col||',
    :new.'||v_col || ', v_descriptor';
  else
    sql_valuesI := ' VALUES ('||sql_seq_name||'.NEXTVAL,''U'',sysdate,
    nvl(wvv_flow.g_user,user),'''||v_col||'',to_char(:old.'||v_col||'), to_char(:new.'||v_col||'), v_descriptor';
  end if;
  sql_valuesI := sql_valuesI || v_insert_values_suffix || ')';
  trigger_body := trigger_body || ' ' || v_if_value_compare || ' ' || --if new value != old_value then
    v_insert_stmt_prefix || sql_valuesI || ';' || ' ' || '--insert into audit table
  ' end if; ';
end loop;
trigger_body := trigger_body || ' end if; ' --end of 'IF UPDATING THEN'
close col_cursor;
trigger_body1 := trigger_body1 || ' end;';      --end of sql_hdr begin
execute immediate SQL_HDR || ' ' || trigger_body || ' ' || trigger_body1;
```

Loop through columns and
build values statement

No Limits to the Power of Configuration

Automated E-Mail Notifications

Name: Overdue Actions Active: Yes Order: 10

Description: Automated E-Mail

Copy From: Selected

E-Mail Subject: Action [ITEM NUMBER] on [SOURCE NUMBER] is overdue

E-Mail Text:

Assign Fields Field Help

Display Order: 1

Screen: 2000 - SSP Change Request

Field Name: P2000_NEXT_WORKFLOW_STEP_SEQ

Hover Help: List of options for moving the selected CR to the next step

Legal Value: - Selected -

Show Workflow Options: Yes

External Description

The user must click the "go" button to move the Change request to the next step

Initiation Instructions

The user must click the "go" button to move the Change request to the next step

External Help File

Currently no External File exist. Please upload one by using region below.

Audit Information

Inserted By/On: APPL_CMST 04/22/2010 07:49:44 AM

Last Updated By/On: NDC/SCORT10B 12/2010 07:58:15 AM

CR Configuration

Create/Edit Form Configuration

CR Name: SSP Closeout CR Active: Yes

Form Title: Space Shuttle Program Closeout Change Request

Description: Space Shuttle Program Closeout Change Request

CR Tab 2: 2101

Document: NISTS 07359 Order: 10

Title: Lightning Protection Test and Analysis Requirements

Selected: 2 of 176

File: https://ssppweb.jsc.nasa.gov/webdata/docweb/nspdocs/71307359.pdf

SPFRCB

Selected:

Configurable systems allow for future growth with minimal cost

Users appreciate the control and power of configurable systems

Menu Item Label: Open Change Requests

Description: The report includes a listing of all Draft and Open Change Requests based on your assigned Security Roles.

Display Information

Display Result: Yes

Column Width: 10

Wrap Columns: Yes

Menu Type: Report from Search

Menu Item URL:

Report Name: CR_Lifecycle_Report

Parameter Type/Region: CR

Static Parameters: (CR_STATUS = 'Open' OR CR_STATUS = 'Draft')

Screen: 55

User: USATXBROWNMIA

Current Build: 0.06.00 3/14/2011

Curator/DBM: Dark A. Brown

External File

Currently no External File exist. Please upload one by using region below.

Audit Information

Inserted By/On: USATXBROWNMIA 08/24/2010 09:36:27 AM

Last Updated By/On: USAFILEMMIA 04/27/2011 03:02:25 PM



United Space Alliance